

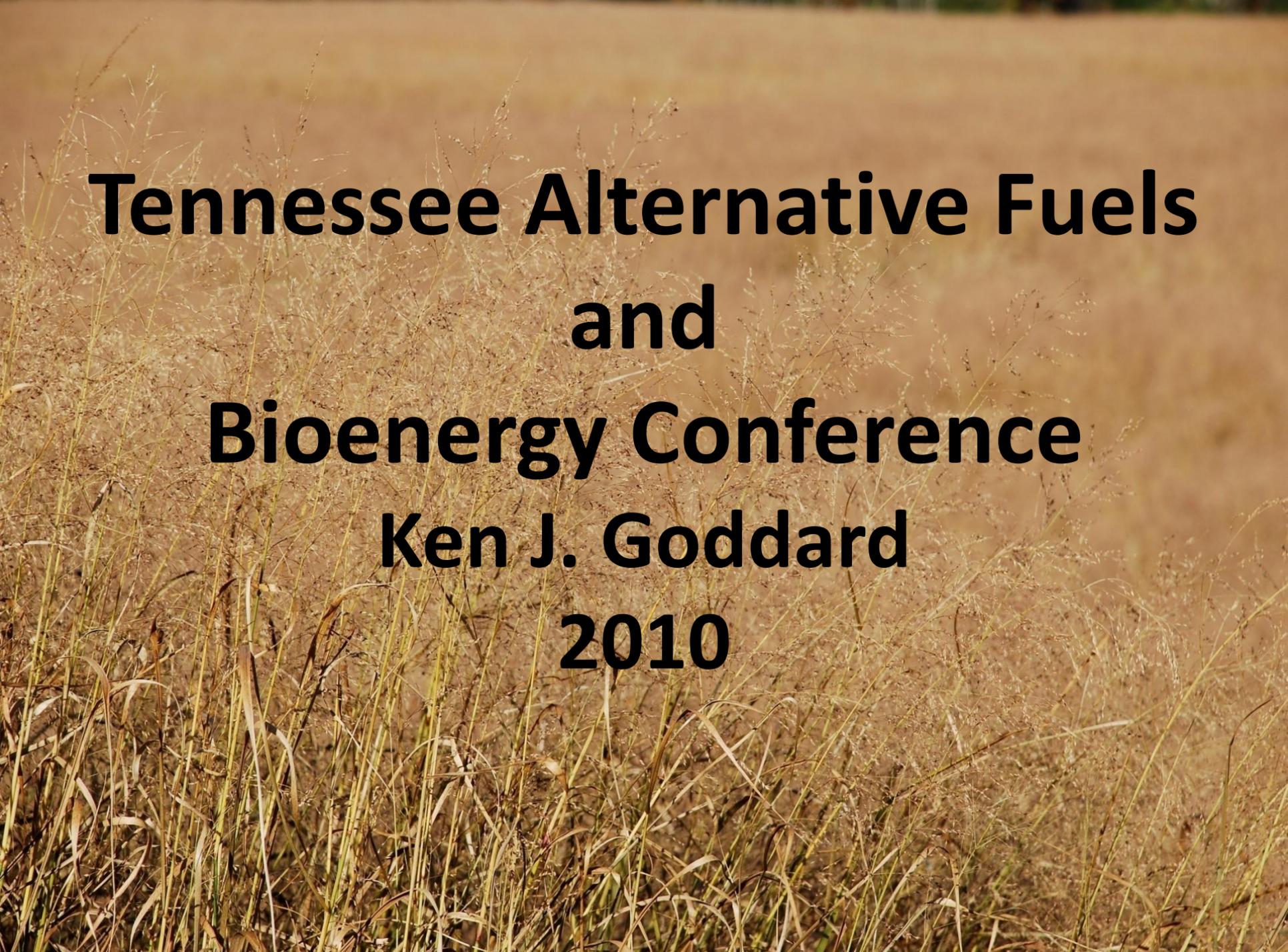
Session 1: Alternative Initiative



Ken Goddard

**-University of Tennessee-
-Switchgrass Program-**





**Tennessee Alternative Fuels
and
Bioenergy Conference
Ken J. Goddard
2010**



Scope

Contract Starting Date	Number of Producers		Acres	Fields
2008	16		723	49
2009	New 24*	+ Repeat 11	1890	150
2010	21**	+ 18	2487	199
Total	61		5100	320

*24 new plus 11 repeat producers totaled 35 producers with switchgrass in 2009

**21 new plus 18 repeat producers totaled 39 producers with switchgrass in 2010



UT Extension

Switchgrass Programs

THE UNIVERSITY of TENNESSEE **UT**
INSTITUTE of AGRICULTURE



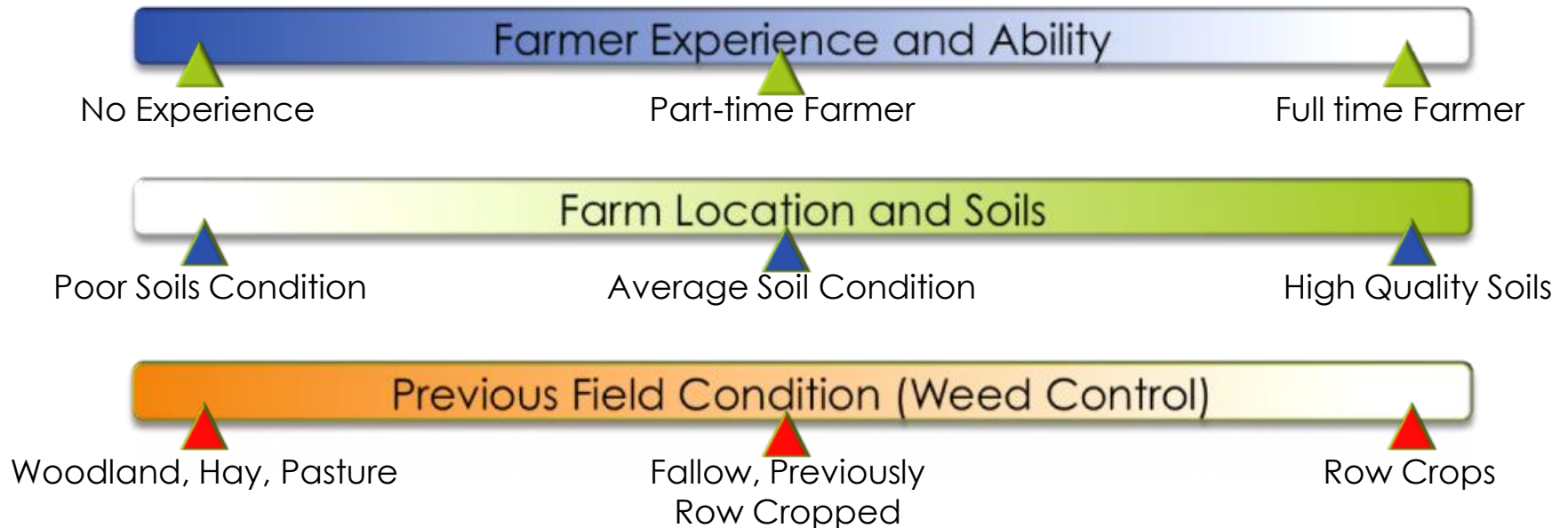






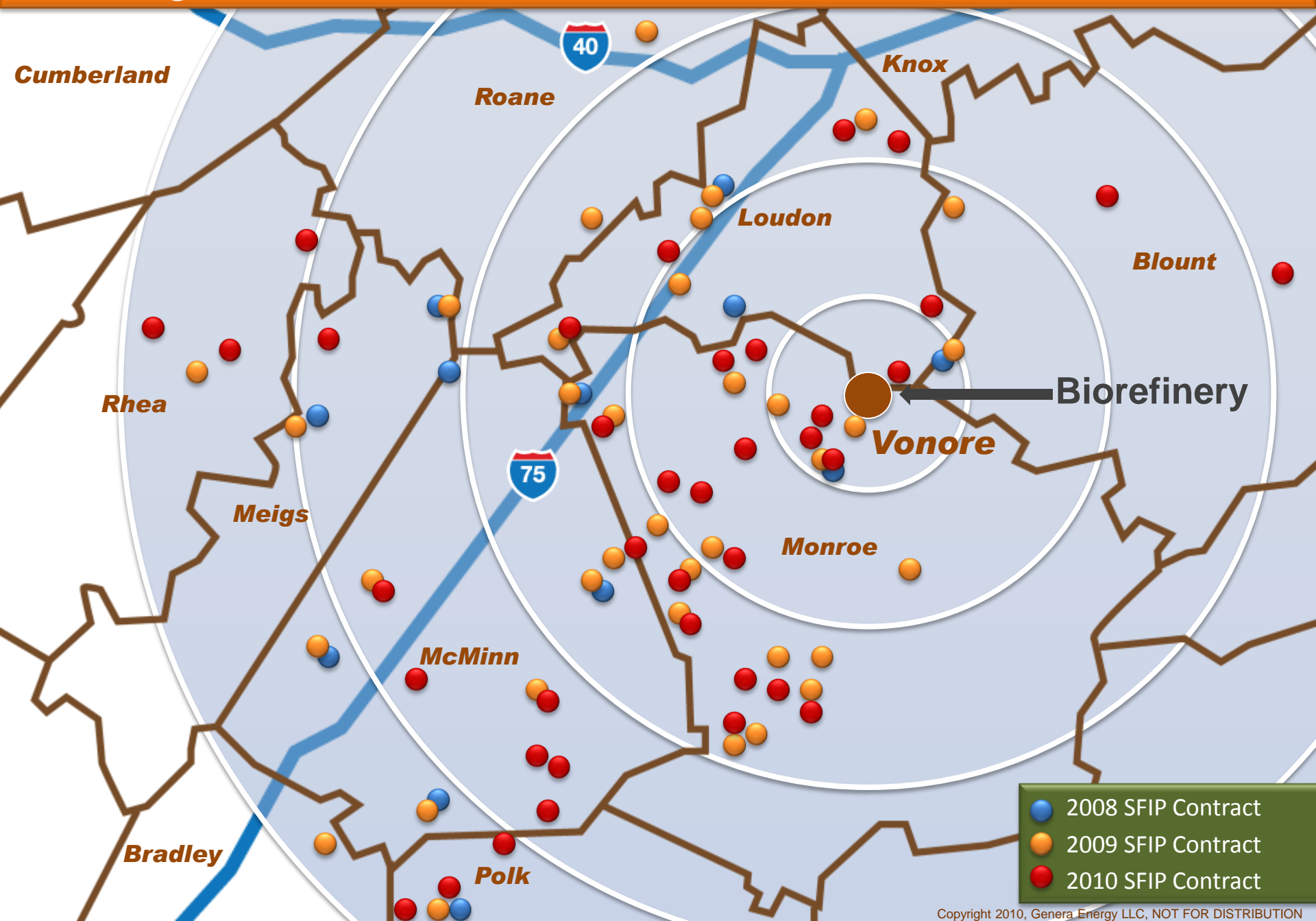
Switchgrass Production

- There are several considerations to recognize when working with farmers. The variability farms/farmers is an important tool in research.





Switchgrass Contract Farms





Switchgrass



- Perennial
- Native species
- Planted with seed
- Relatively low input crop
- No specialized planting or harvesting equipment
- Competitive advantage in the Southeast
- Soil Conservation, Wildlife, Soil Types



Switchgrass and other native warm season grasses are seeded based on % Pure Live Seed (PLS)

$$\% \text{ PLS} = \frac{\% \text{ Germination} \times \% \text{ Purity}}{100}$$

UT currently recommends 6 pounds of PLS per acre.

$$\text{Seed needed} = \frac{6}{\% \text{ PLS of seed}} \times 100$$

BAMERT SEED COMPANY INC

1897 CR 1018; Muleshoe, TX 79347; 806-272-5506

Permit#: TX00905

ALAMO SWITCHGRASS

Lot #: 27052ARC

Test Date: 2/08

Origin: TX

Pure Seed 98.68%

Germination: 92.00%

Inert 1.29%

Dormant: 3.00%

Other Crop 0.01%

Hard: 0.00%

Weed Seed 0.02%

Total Germination: 95.00%

Pure Live Seed: 93.75%

Net Wt: 50.0 lbs

Noxious Weed Seed Per Pound: NONE

IMPORTANT
DO NOT MAKE SHARP
TURNS WITH OPENERS
IN THE GROUND



Soil Test Recommendations for Establishment and Maintenance of Switchgrass for Biomass (SWBIO)

	Nitrogen	Phosphate (P ₂ O ₅)			Potash (K ₂ O)		
	Practice						
	(NT)	L	M	H	L	M	H
1. Establishment Year	0	40	0	0	80	0	0
2. Maintenance Year	60	40	0	0	80	0	0
*NT = Not Tested L = Low M=Medium H= High							

No-till Planting Equipment

- Drills designed for no-till planting are essential
- Coulters and disk openers or offset disk openers are necessary to cut sod and residue
- Press wheels insure seed-soil contact
- A small seed hopper is required to accurately meter switchgrass



Great Plains

606NT







Yield Expectations

- 1st year – 30% yield (Milan 1 to 2 tons DM)
- 2nd year – 70% yield (Milan 4 to 5 tons DM)
- 3rd year – 100% yield (Milan 7 to 12 tons DM)
- Established Switchgrass budgets are calculated at 5.5 tons per acre.

Harvest

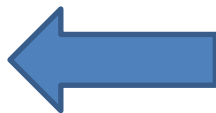
- Harvest after first killing frost or November 1
- Use Disc Mower-Conditioner to windrow and condition
- Use pasture clipping extensions or lift cylinder stop collars to leave 5-6 inch stubble height
- Directly follow mower conditioner with baler after windrow cures to appropriate moisture levels



















OL' GRIZZ
Model 3615

KODIAK

















Before

After











TRU-TEST

ID 3000

1725

Enter Data



























Pete Nelson

-Memphis AgBioworks Initiative-



Bioenergy in Tennessee: An Agricultural Perspective

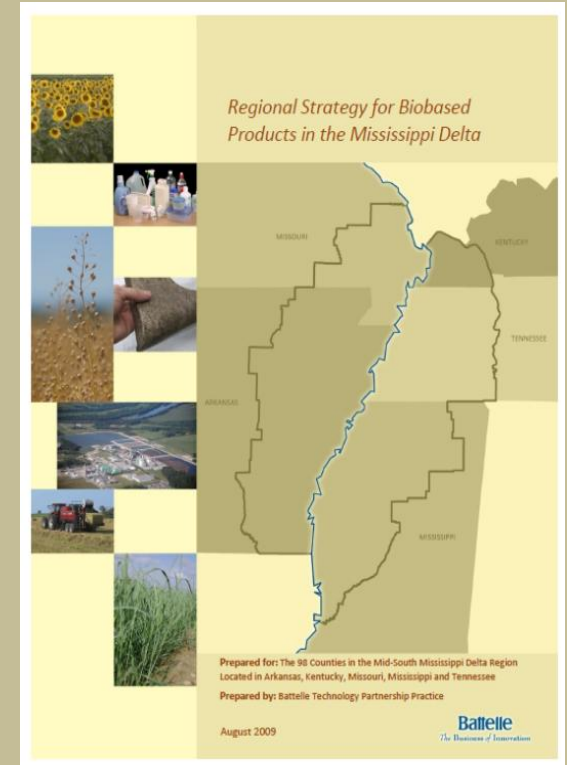


Tennessee Alternative Fuels and Bioenergy Conference

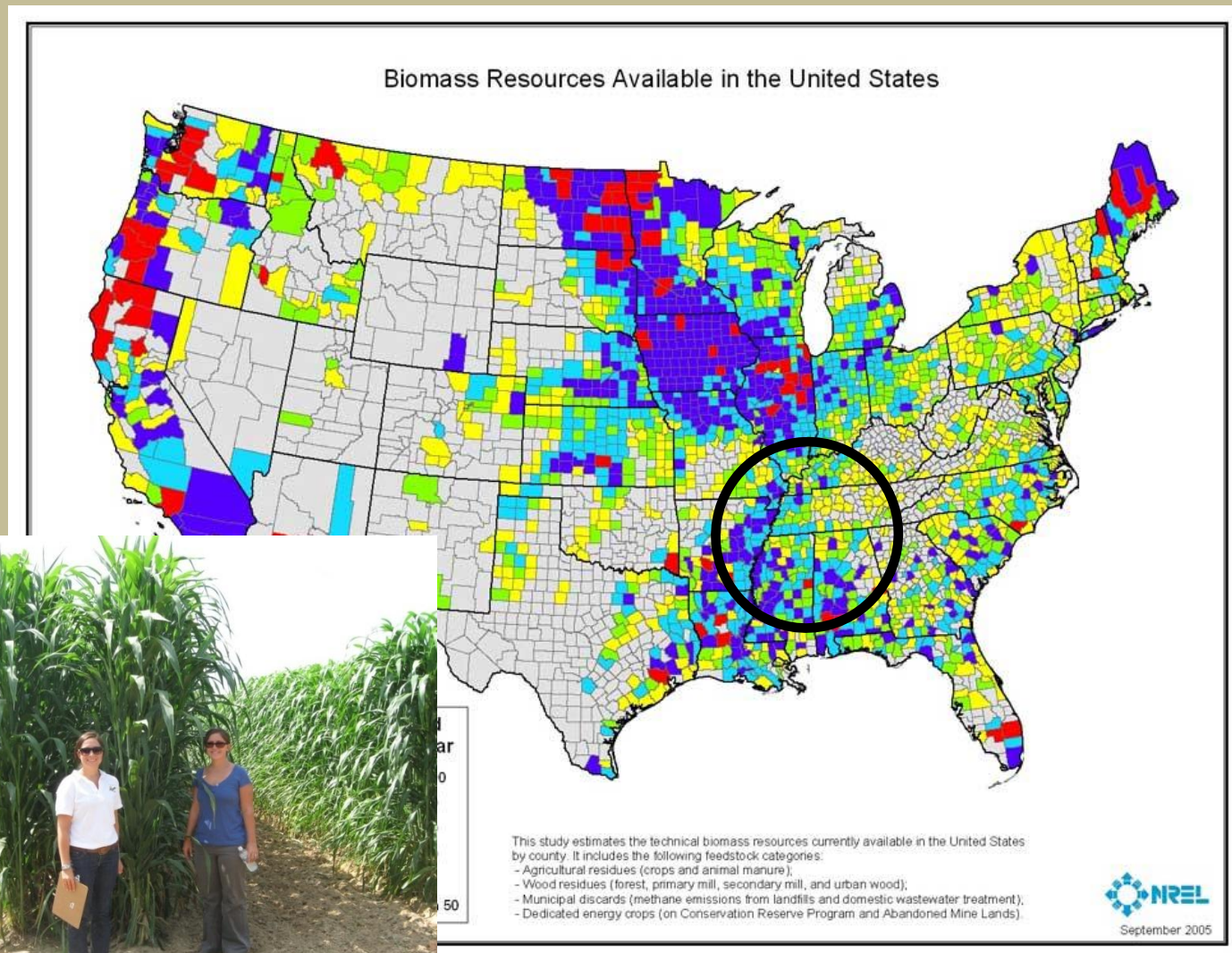
August 16-17, 2010

AgBioworks Regional Initiative

- 501c3, non-profit regional initiative based at Memphis Bioworks Foundation, with partnering offices in Murray, KY and Sikeston, MO.
- MBF: Workforce, Infrastructure, Entrepreneurialism
- Focused on creating new opportunities for farmers and local businesses by introducing alternative crops to the region.
- Coordinated regional strategy for biobased products (with Battelle) – included 50 organizations, and 98 counties in 5 states.
- www.agbioworks.org



Biomass: The Renewable Resource for Tennessee

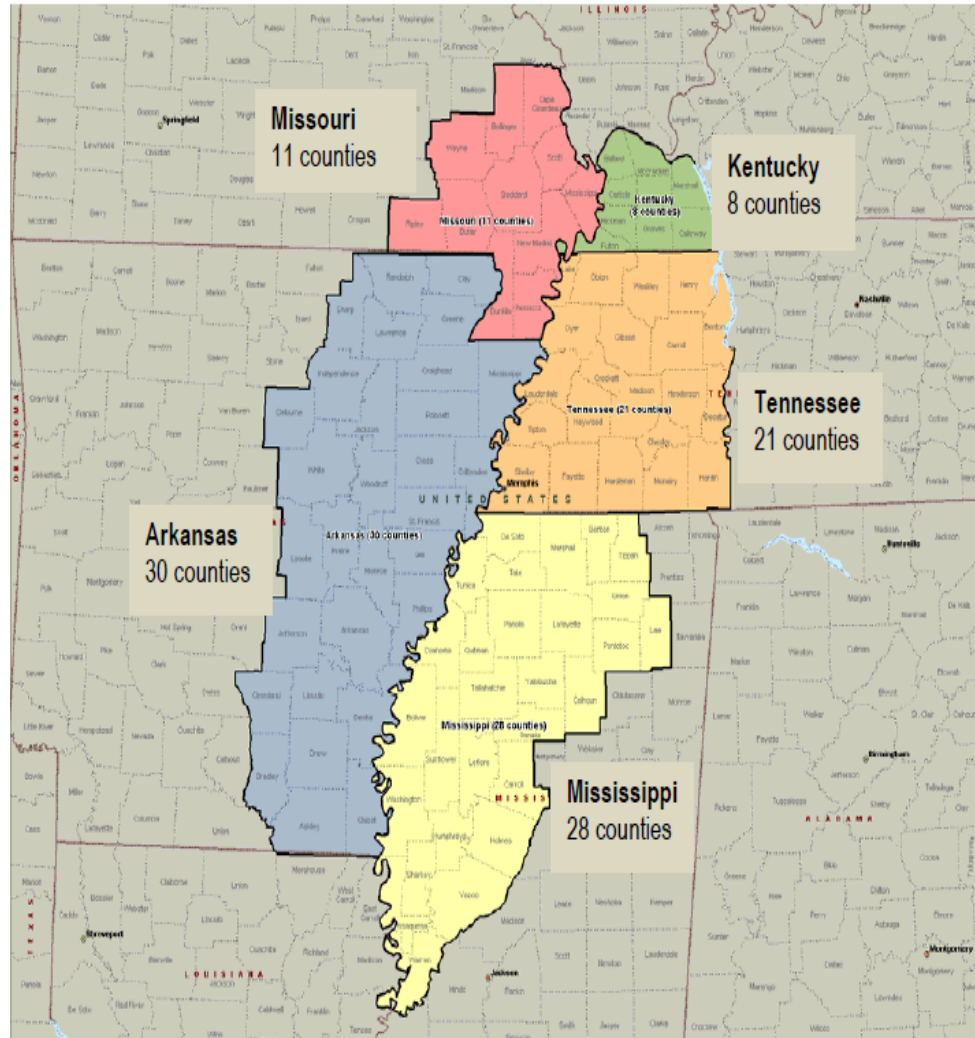


M E M P H I S



AGBIO

Mid-South Region Agriculture



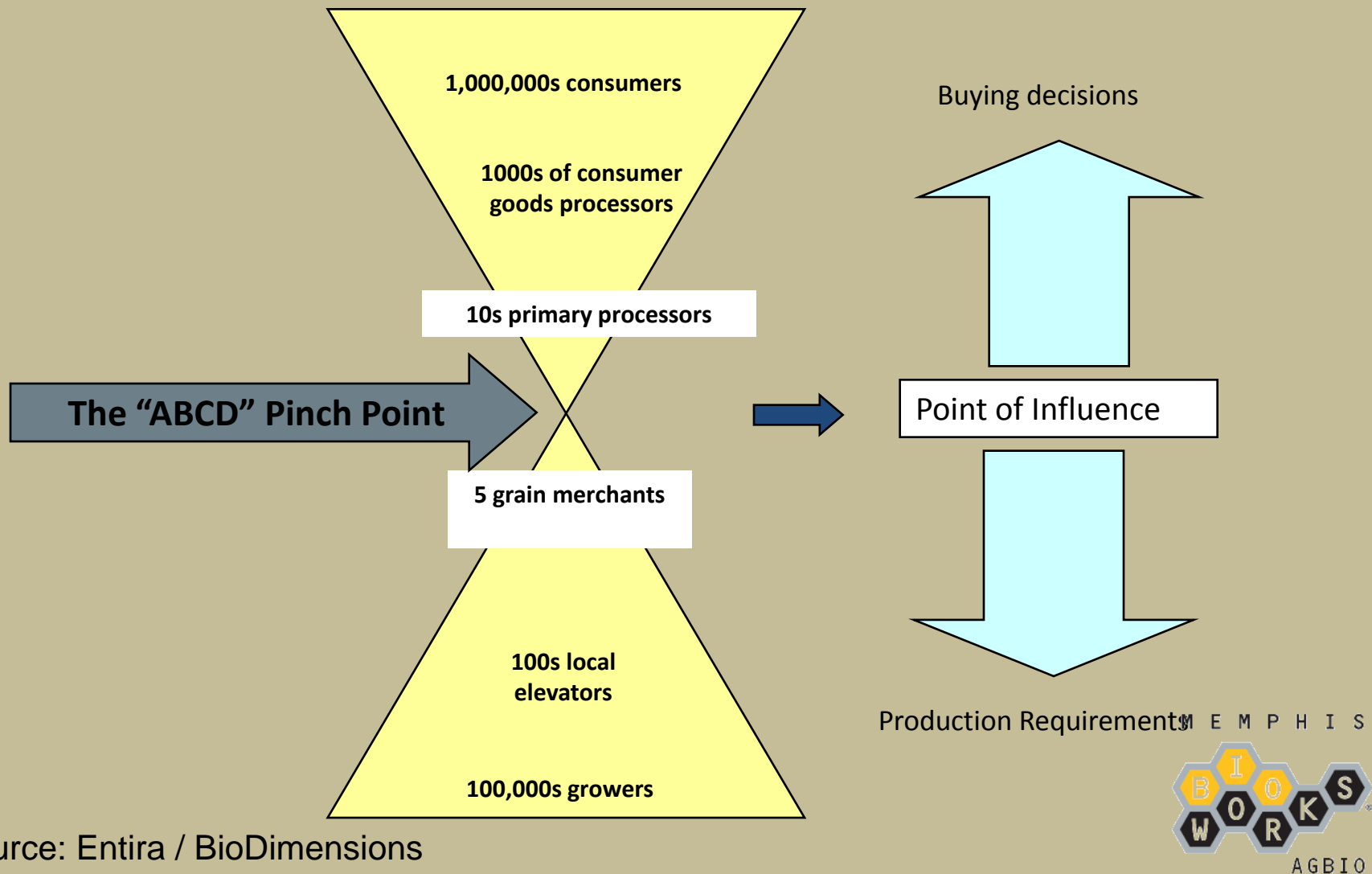
<u>Crop</u>	<u>Qty</u>	<u>Acre</u>	<u>Price</u>	<u>Value</u>
<u>Soybean</u>	196 M Bu.	6 M Acres	\$8.5 Bu.	\$1.7 Billion
<u>Rice</u>	119 M Cwt.	1.7 M Acres	\$10 Cwt.	\$1.2 Billion
<u>Corn</u>	393 M Bu.	2.6 M Acres	\$3.5 Bu.	\$1.4 Billion
<u>Cotton</u>	1 M tons	2.3 M Acres	\$.60 Lb.	\$1.2 Billion
TOTAL		12.6 M Acres		\$5.5 Billion

MEMPHIS

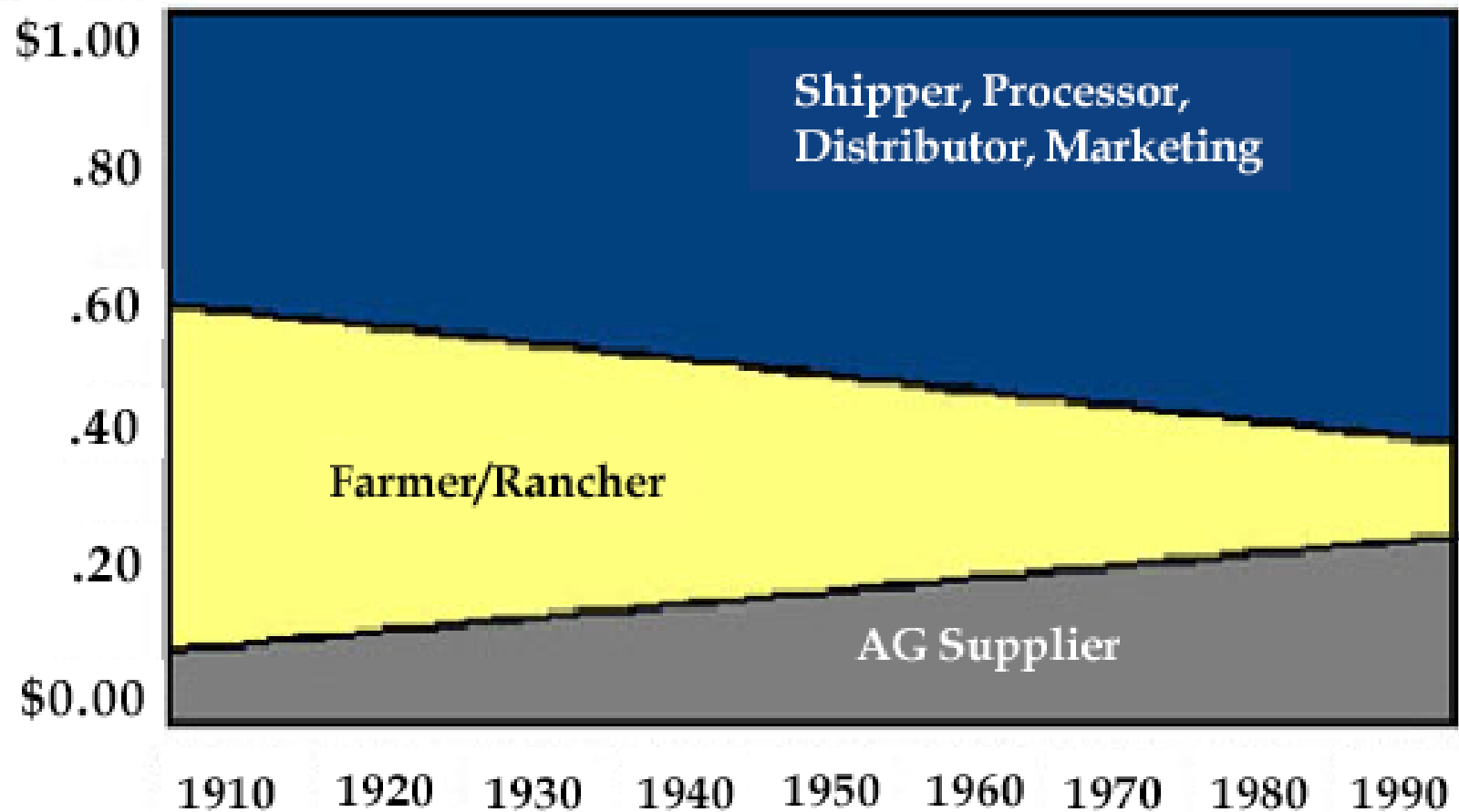


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U.S. Agriculture Value Chain



Where the Food Dollar Goes (1)



M E M P H I S

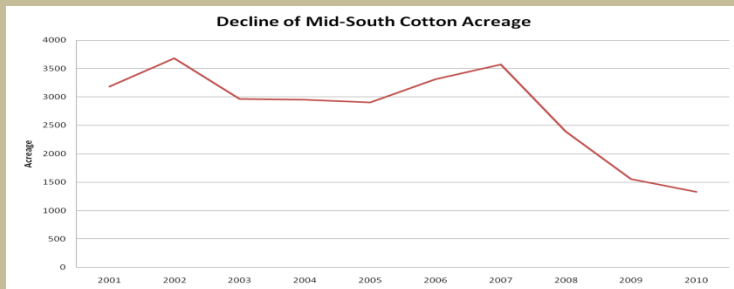


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West TN Changing Trends

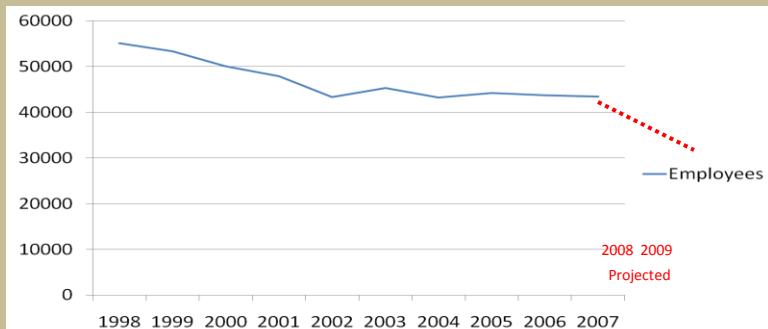
Agriculture

Declining Cotton Acreage in AR, MO, MS & TN (1980-2009)



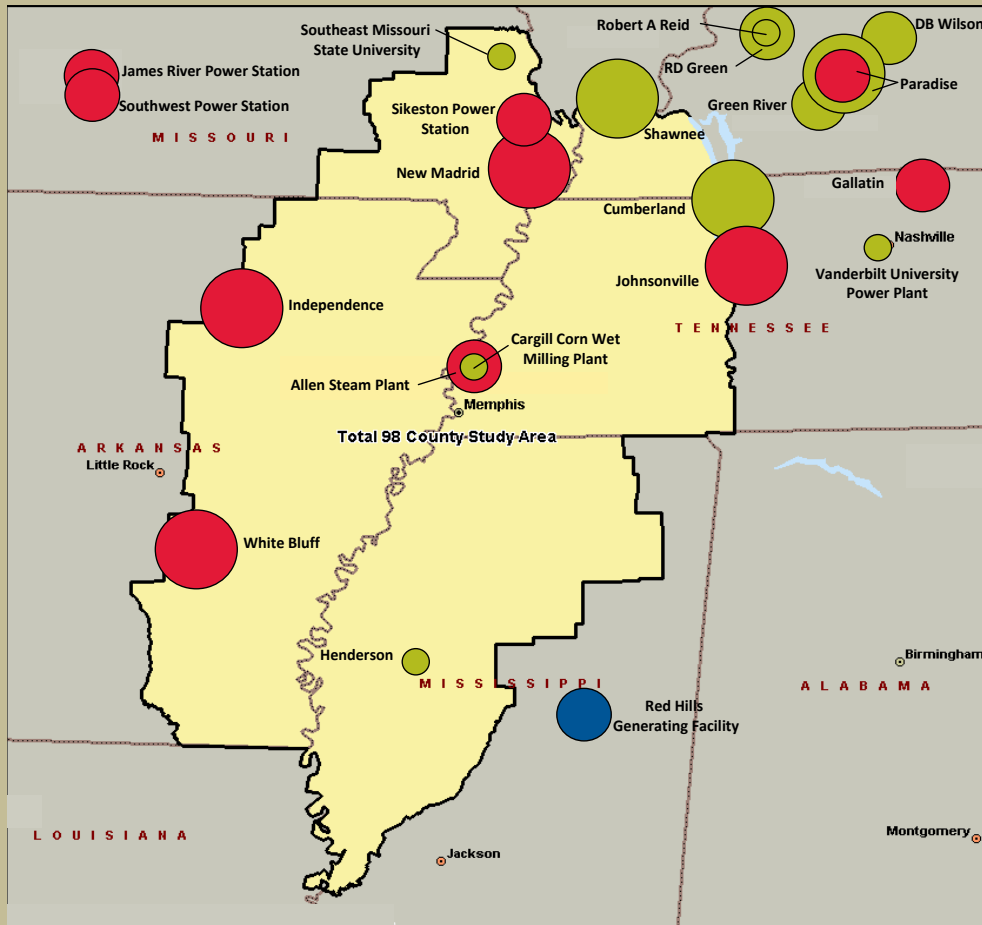
Chemical Manufacturing

Declining Manufacturing Employment in the Memphis MSA



1. Decline in the cotton industry is not just acreage, but an entire integrated supply chain.
2. Replacing cotton with corn and soybeans does not create value-added jobs.
3. Global trade, labor, and volatile energy markets have driven chemical industry overseas, leaving underutilized assets in U.S., including TN.
4. 10% of export dollars are for chemicals.
5. The core regional assets of diverse acreage, farmers, logistics and industrial manufacturing, remain intact.

Biopower / Bioenergy



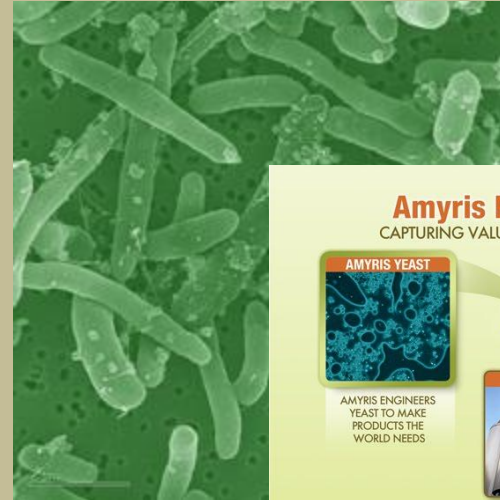
- Potential for **sixty** 50,000 ton per year pellet/briquet plants to co-fire biomass with coal
- Could replace 15% of coal in regional utility plants



1st Gen and Advanced Biofuels



Enough sugar and cellulosic biomass crops can be grown sustainably to produce 4.7 billion gallons of ethanol without affecting the output of food and fiber in the region.



Biobased Products / Green Chemicals

Non-food based feedstocks and biomass



Lignochemicals



Lignochemicals

- High value specialty chemicals
 - High molecular weight (HMW) lignins
 - Xylose
 - Alcohols
- Derived from natural, non-food renewable materials
- Replacing petroleum-based industrial chemicals

Highly confidential and proprietary - not to be distributed without permission

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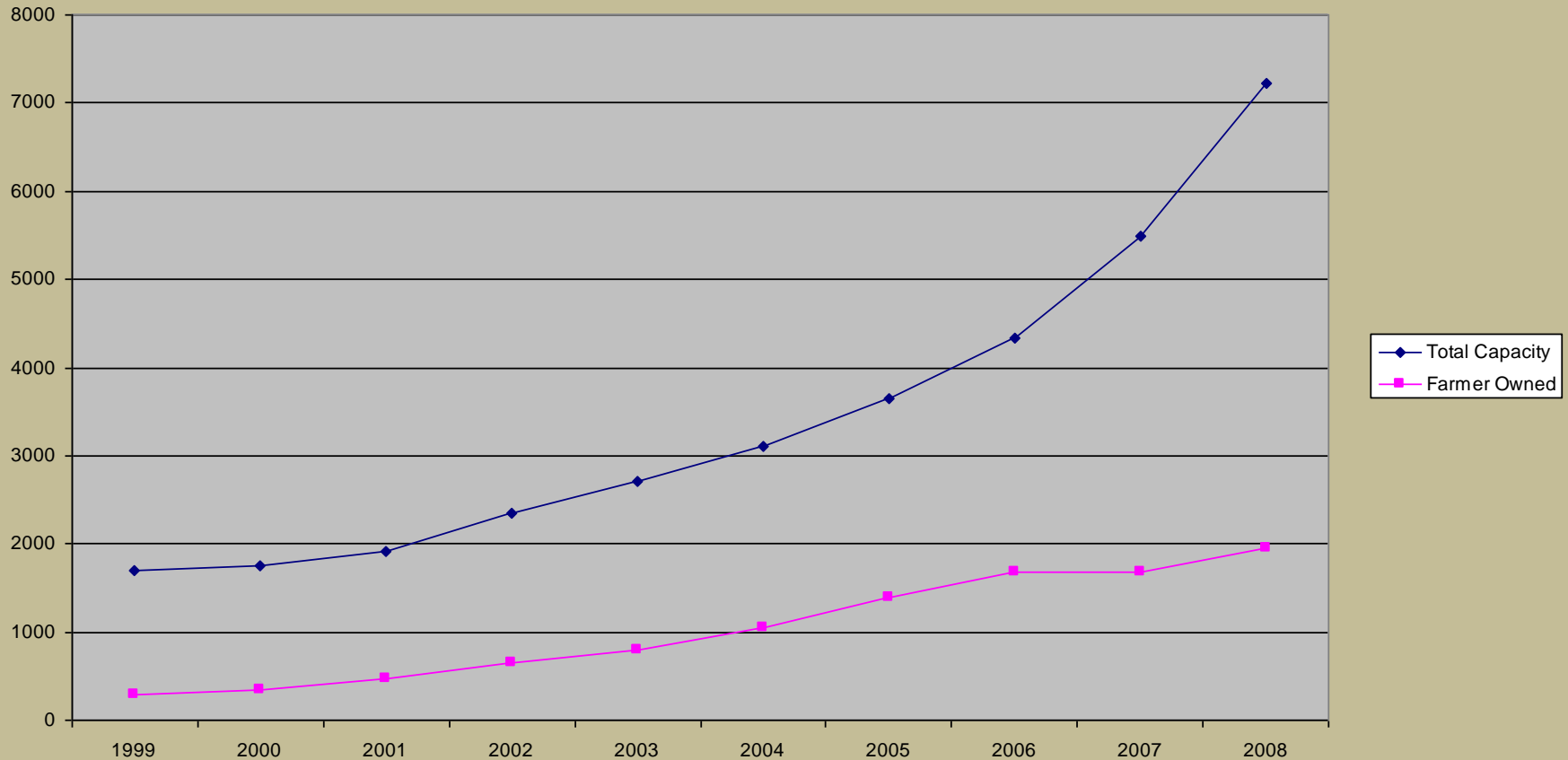
purepower



\$1 trillion global sales for chemicals, 2/3 can be replaced by plant based materials, representing 50,000 different products. - Cargill/McKinsey.

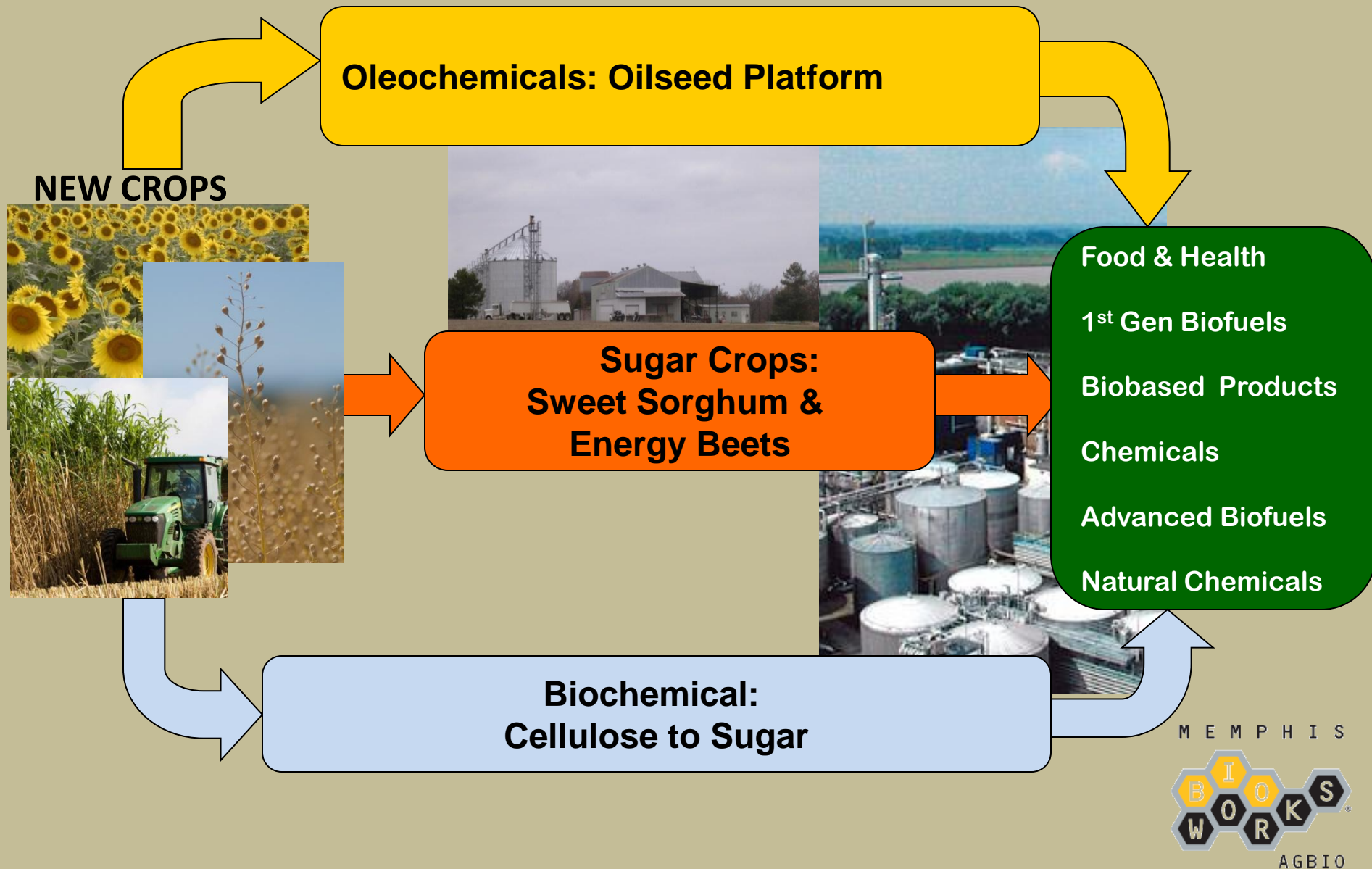
The Farmer's Role in Ethanol

U.S. Ethanol Production (mgy)



Source: Renewable Fuels Association

Strategy for Tennessee Supply Chain Development



Oilseed Development in Tennessee

- Calgene scale up (1980s/90s).
- Various canola and sunflower trials underway in the region since 2000.
- High value potential, benefits as rotation crop (for yield and field).
- Multiple processing ventures and plans underway in the region.
- Increased interest from growers, seed companies, and end users.



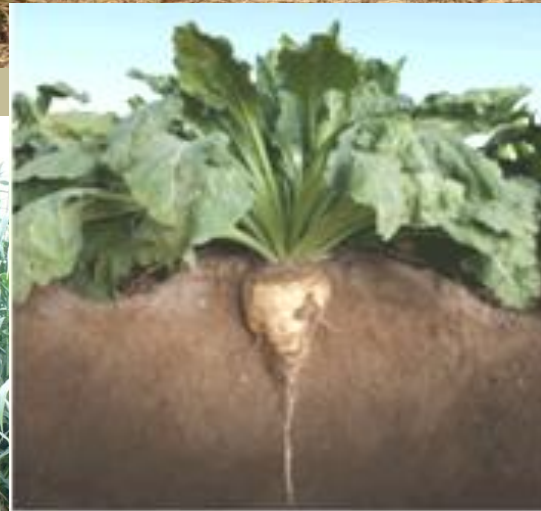
M E M P H I S



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Sweet Sorghum and Energy Beets

- High yields, easy ethanol
- Crop trial sites across region (w/ 3 seed companies)
- Harvesting trials with CNH Corp.
- Pilot plant in former cotton gin.
- 2nd year processing trials
- Fermentation program underway
- Small scale lab for testing



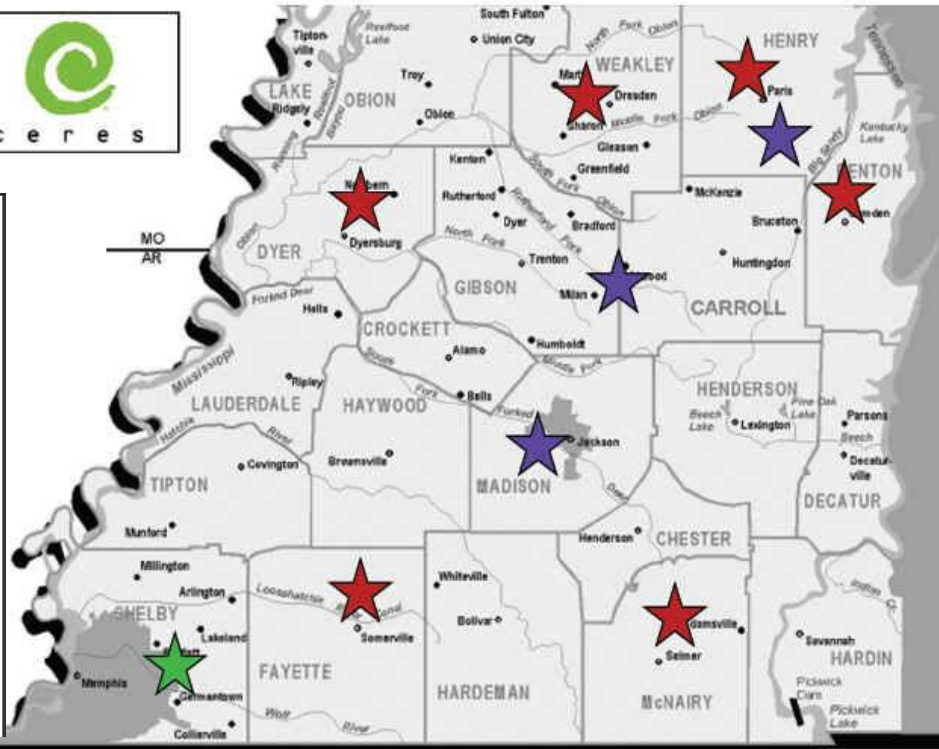
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Biomass / Dedicated Energy Crops

West Tennessee Bioenergy Crop Program with CERES Memphis Bioworks Foundation & BioDimensions Inc.



NewsWatch

Making a switch in Tenn.



THE tiny seeds Tony and Tina Drennon put in the ground this fall won't have an immediate impact on the local economy, but the brothers are confident the potential benefits are significant.

The Drennon family, farmers who have been growing sorghum for generations, are part of a growing movement in Tennessee to switch from traditional crops like cotton and soybeans to dedicated energy crops. The brothers are growing sorghum for bioenergy, a crop that can be used to produce ethanol and other biofuels.

Second-year sorghum farmer Tony Drennon says the crop is a good opportunity for him and his brother, Tina, to diversify their income. "We're a good opportunity for us to see what the future of sorghum is," he says. "It's a good opportunity for us to see what the future of sorghum is."

The Tennessee Department of Agriculture is also promoting the crop. "We're a good opportunity for us to see what the future of sorghum is," he says. "It's a good opportunity for us to see what the future of sorghum is."

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Livestock producers ID detrimental regulation

BY PAM GOLDEN

Legislation that would require livestock producers to identify their animals as part of a biosecurity program has been met with resistance from some producers. The legislation, which would require producers to identify their animals as part of a biosecurity program, has been met with resistance from some producers.

The Tennessee Department of Agriculture is also promoting the crop. "We're a good opportunity for us to see what the future of sorghum is," he says. "It's a good opportunity for us to see what the future of sorghum is."



Commercial Switchgrass Trials
2.5 acres of EG 1101 Switchgrass
2.5 acres of EG 1102 Switchgrass



Research Trials @ Agricenter International
EG 1101 Switchgrass
EG 1102 Switchgrass
ES 5140 High-Biomass Sorghum
ES 5150 High-Biomass Sorghum



University of Tennessee
Research Trials and 125 Acre Commercial Production Project

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Biomass Crops for the Future



Plant-Made Proteins



Specialty Oilseeds



High Amylopectin Potato



Energy Beets



Biofibers



Barley & Specialty Grains

M E M P H I S



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It Starts with the Farmer



M E M P H I S



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25Farmer Network: Model Program

- Funded by TNDA grants and private companies.
- 22 leading farmers in West Tennessee.
- 58,500 acres and agricultural assets.
- Interested in new business development opportunities.
- Expanding network in Kentucky and Missouri.



MEMPHIS



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25Farmer Network: Key Accomplishments

- 1 farmer owned processing business started and more in the pipeline.
- Leveraged State Grant to over \$1 million invested from private companies through 2010 including CNH Corporation, KBH, and seed companies.
- Crop trials of new bioenergy crops underway throughout region.

25Farmer Network: New Crops in Tennessee

Crops	2009 (TNDA Grant)	2010 (leveraged private investment)	2011 (projected)	<u>2015 Target</u>
Sunflower	65	80	500	-
Sweet sorghum	25	180	1000	-
Energy beets	0	26	250	-
Strip trials: switchgrass & canola	25	31	500	-
Total Acres	115	317	2,250	150,000

- Incremental acreage increase for key target crops.
- Additional crops in the “pipeline”: high erucic acid rapeseed, winter barley, biomass sorghum...

Final Thoughts

- Plants (crops and trees) and the people who grow them are the most significant bioenergy asset for our region.
- Bioenergy markets must benefit the farmer, open up rural processing opportunities, and lead to diverse new markets.
- An active farmer network leads to great results before it is time to form a business or contract for large amounts of crops.
- Partners, partners, partners.

For more information:

- Pete Nelson, (901)315-1694, pnelson@biobased.org
- www.agbioworks.org
- Please plan to attend:
 - Biomass South 2010, October 14-15, 2010, Memphis



**Early Bird Registration
Ends September 1!
Register Today!**

Dr. Jim Byford

-Obion Ethanol Plant-

-Dean Emeritus UT Martin –

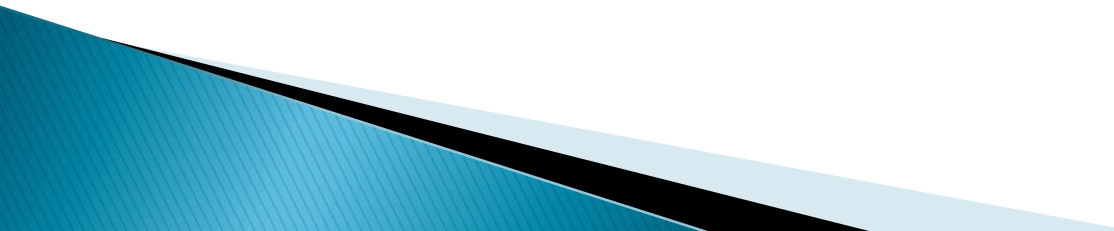
-College of Agriculture & Applied Sciences-



Ethanol and Agriculture

With A Focus On
The Obion, Tenn. Ethanol Plant

A lot of negative
publicity
about ethanol – –
late 2007 – early 2008



- ▶ World food costs up over 40% that year

Anti-Ethanol Campaign

In summer of 2007, the Grocery Manufacturers Association paid \$300,000 to the Glover Park Group to conduct a media campaign to blame ethanol for rising food costs.*

*Senator Grassley/Testimony on Senate Floor
May, 2008



Ethanol vs Food

Even though world food costs were up over 40%, ethanol was responsible for less than 3%

Texas A&M Study on Rising Food Costs*

- ▶ Corn prices – – little effect
- ▶ Renewable Fuel Standard – – no effect
- ▶ Speculation in commodity markets – – some effect
- ▶ Higher oil prices – main reason

*Texas A&M University

Average Food Item

Transported 1500 miles*

*LECG Global Expert Services



A Little Math:

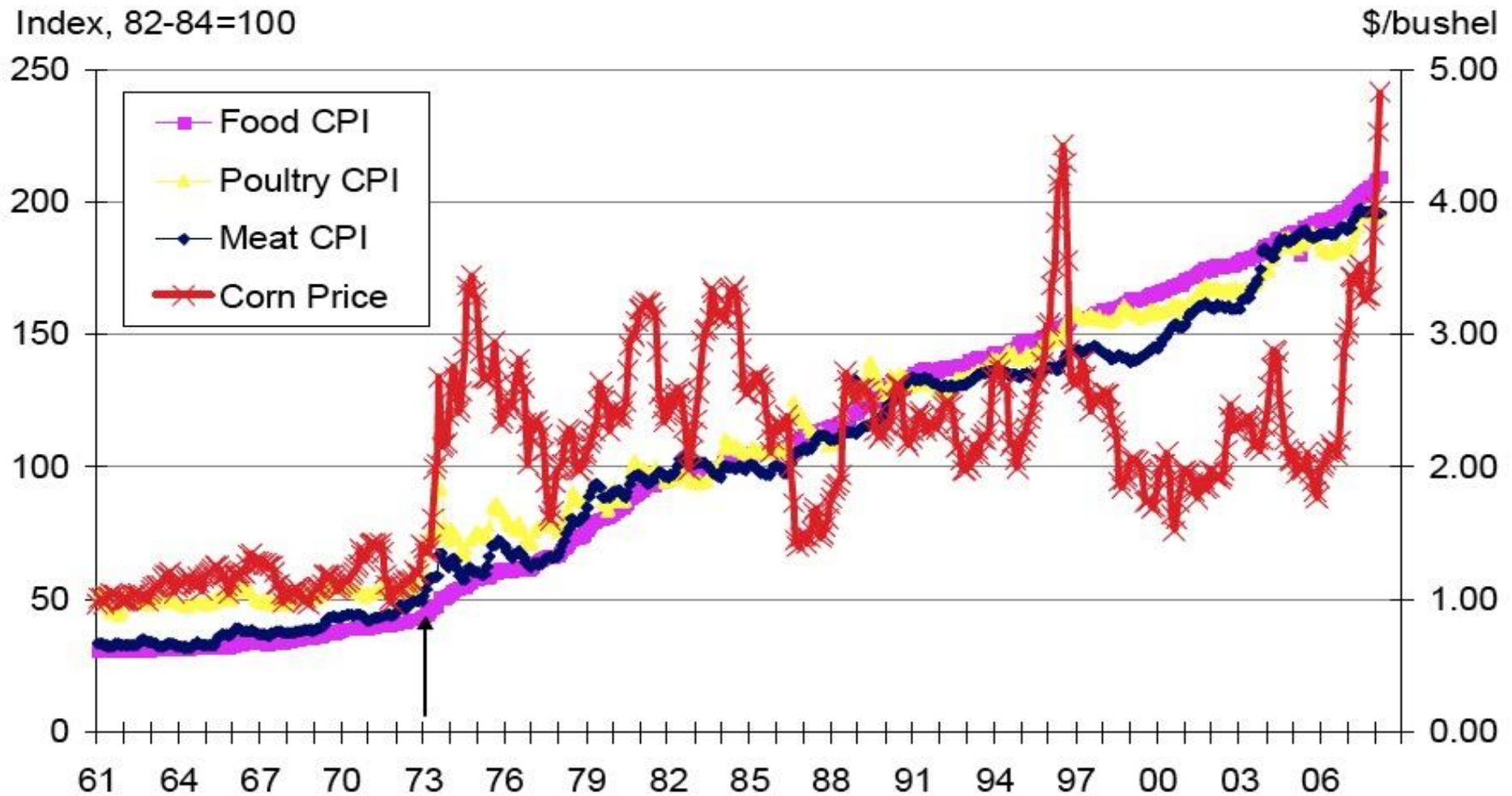
At \$4 per bushel of corn, a \$4 box of corn flakes contains less than a nickel's worth of corn.*

If you double the price of corn (\$8), you have a dime's worth of corn in the \$4.05 box of cornflakes.

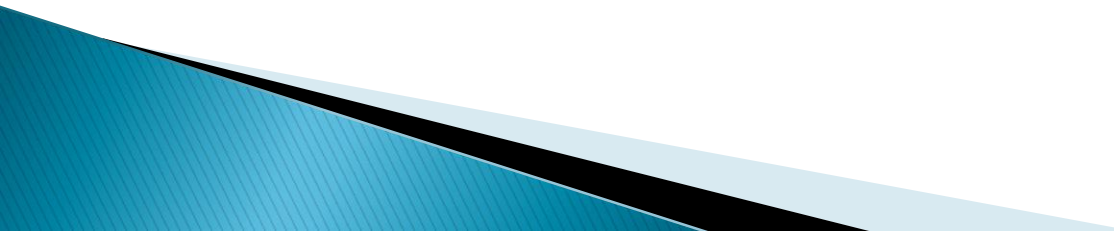
*National Corn Growers Association



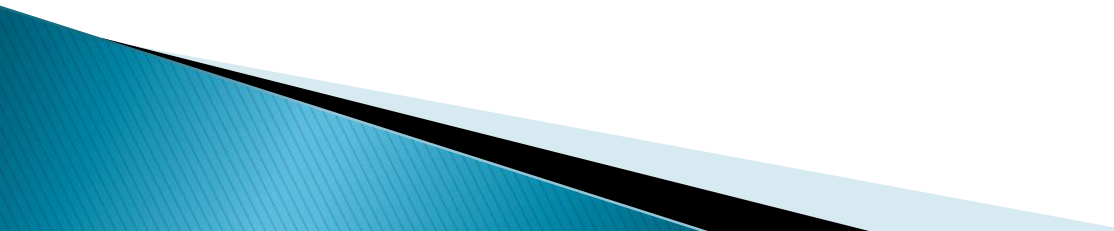
CORN PRICE & CPI FOR FOOD, MEAT & POULTRY



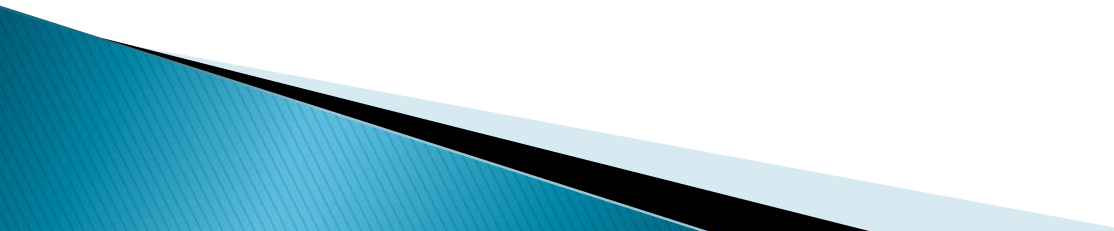
Other negative claims against ethanol

- ▶ Uses more energy than it yields
 - ▶ Causes deforestation in Brazil
 - ▶ Pollutes environment
 - ▶ Wastes water
 - ▶ Fewer miles per gallon than gasoline
- 

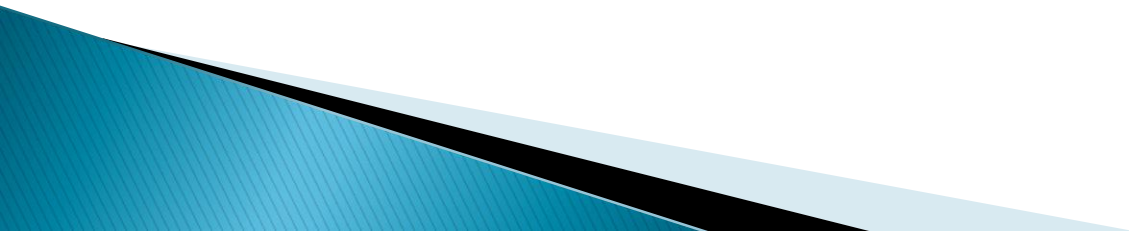
All claims disproven by:

- ▶ US Dept. of Agriculture
 - ▶ Argonne National Lab
 - ▶ US Dept. of Energy
 - ▶ Michigan State Univ.
 - ▶ Univ. of Minnesota
 - ▶ Colorado School of Mines
- 

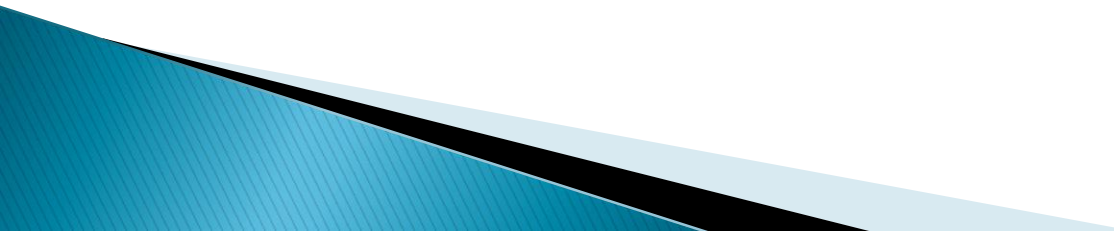
Due to negative media campaigns:

- ▶ Ethanol industry has had a couple of tough years
 - ▶ Some ethanol companies have gone bankrupt
 - ▶ Other plants have temporarily shut down
(However, some have started back up)
- 

**But the ethanol industry has
continued to grow, nevertheless**



Ethanol currently produced in the U.S. (as of 7/15/2010)

- ▶ 200 plants
 - ▶ 13.5 BG capacity
 - ▶ 14 BG, if all plants were operating
 - ▶ U.S. demand—12.5–12.7 BG
 - ▶ Rest is exported
- 

- ▶ Most is sold as 10% blend (E10)
- ▶ Demand is restricted due to:
 - EPA limit of 10% blend for typical gas pumps
 - Shortage of E85 and blender pumps
- Ethanol is currently about 40 cents per gallon cheaper than gasoline

Federal Legislation

Renewable Fuels Standard:

36 BG by 2022 (2007 Energy Act)

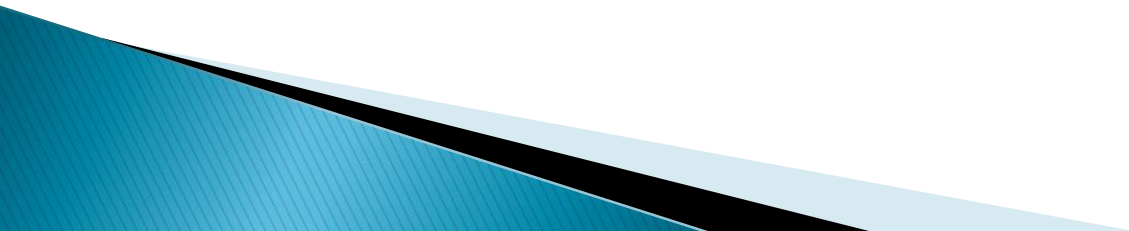
- 15 BG Corn Ethanol
- 20 BG Cellulosic Ethanol
- 1 BG Biodiesel



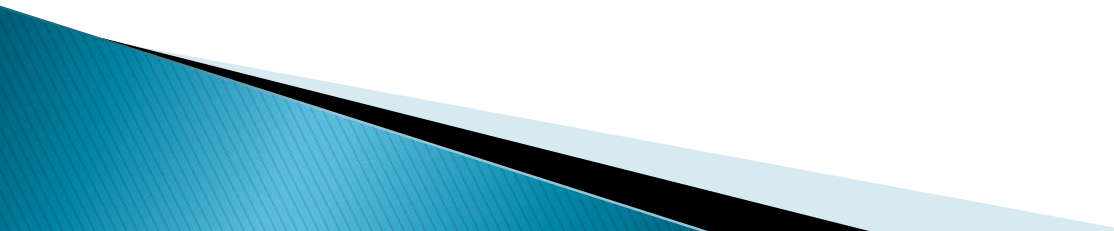
- ▶ Corn ethanol is 90% there already (13.5 BG of 15 BG in RFS)—even though insufficient fuel pump infrastructure and EPA limit of 10% blend prevents availability to U.S. consumers

- ▶ Progress is being made on cellulosic ethanol, but development has been slowed, due to negative ethanol publicity

Ethanol's Effect On Agriculture



Corn Prices

- ▶ \$2.25/bushel ave. in 2006 (and several years prior) before ethanol expansion
 - ▶ \$3.50/bushel ave. since 2007 as ethanol industry has expanded
 - ▶ Increase of \$1.25/bushel
- 

- ▶ Adversely affected livestock industry, especially at first
- ▶ However, increasing availability of distillers grains (an ethanol byproduct that is cheaper than corn and has more protein) has lessened the impact in the last 2 years

- ▶ Corn farmers and agricultural scientists have responded

U.S. Corn Yields*

Keep Increasing

1988 – – – – 84.6 bu/acre

1998 – – – – 134.4 bu/acre

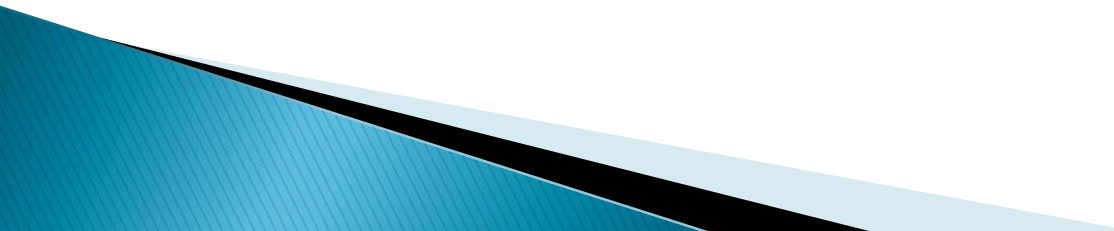
2007 – – – – 151.1 bu/acre

2009 ----- 164.7 bu/acre

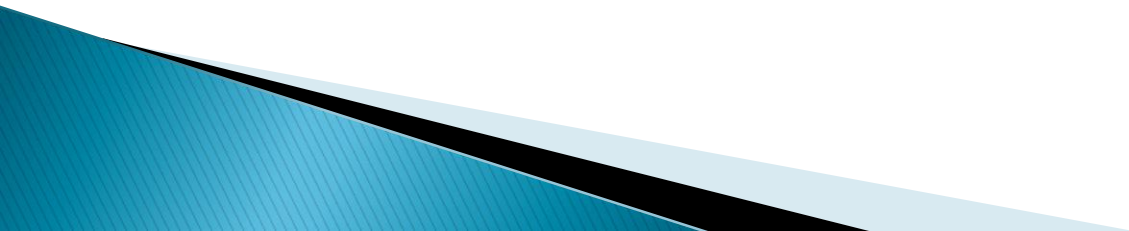
*National Corn Growers Association



- ▶ 300 bu/acre projected by 2030
- ▶ 2009 yield contest winner—307 bu/acre

- ▶ Cellulosic ethanol will help even more farmers, in time
 - ▶ Even though some cellulosic ethanol will be made from landfill waste and other recycled materials, most will be made from plant materials produced on our nation's farms and woodlands
- 

Update on the ethanol plant in Obion, Tennessee



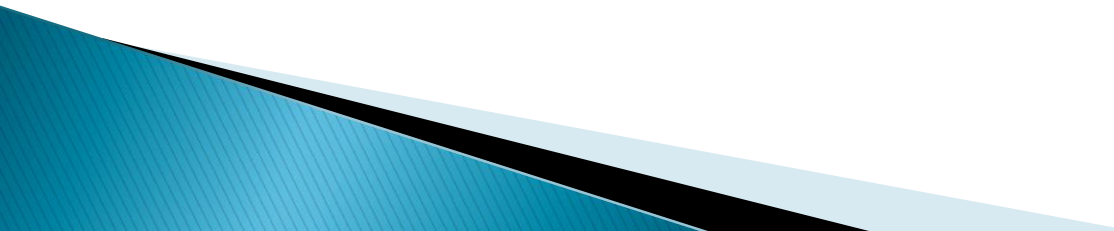
- ▶ The plant began production in November, 2008
- ▶ It produces 117 million gallons per year





- ▶ Merged with Green Plains Renewable Energy (GPRE) in May, 2008

GPRE

- ▶ Headquarters in Omaha, Nebraska
 - ▶ 6 plants in 4 states (Tenn., Indiana, Iowa, Nebraska)
 - ▶ Bought 2 Nebraska plants from bankrupt Vera Sun
 - ▶ 500 million gallons/year
 - ▶ 4th largest ethanol company in the world
 - ▶ NASDAQ Global
- 

GPRE has diversified portfolio

- ▶ Farmers' supply company in Iowa
- ▶ Grain elevators in 12 communities
 - 7 in Iowa
 - 5 in Tenn. (Como, Dyer, Kenton, Trenton, Union City)

GPRE diversified portfolio cont'd

- ▶ Ethanol blending company in 7 states
 - 2 in Tenn. (Nashville/Knoxville)
 - 500 BG blended gasoline
 - 700 mil. gal. ethanol
 - Cuts out middleman at lower end of supply chain

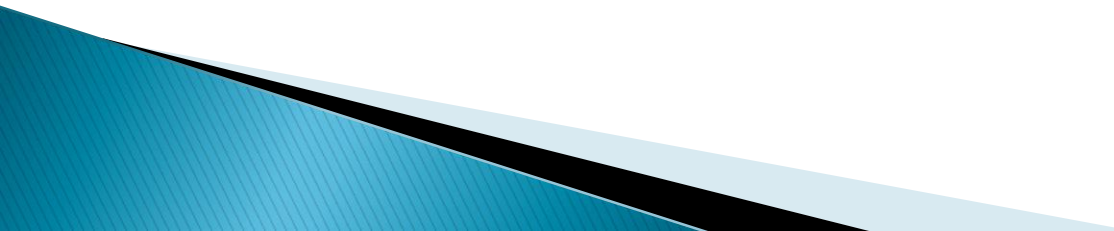
GPRE diversified portfolio cont'd

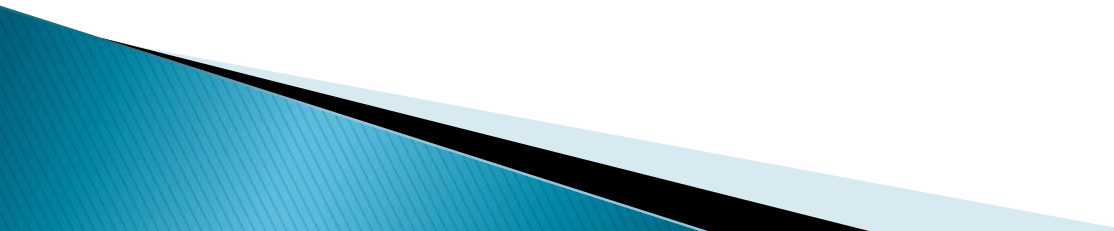
- ▶ Ethanol Marketing
 - 4 independent plants, in addition to GPRE's 6 plants
 - 840 mil. gal. total (500/GPRE and 360/other)

GPPE diversified portfolio cont'd

- ▶ 1.5 million tons distillers grains
- ▶ Algae production at Shenandoah, Iowa plant
(feed algae wastewater and CO₂ from ethanol
distillation process)

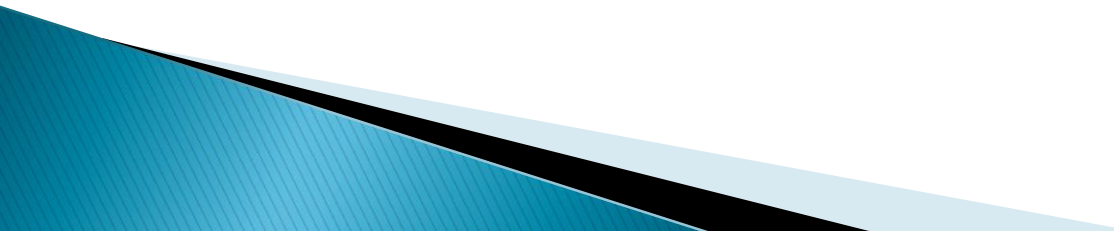
GPPE diversified portfolio cont'd

- ▶ Have just announced they will add grain fractionation at all 6 plants
 - ▶ To separate corn oil from the germ before making ethanol from the rest of the corn kernel
 - ▶ Obion, TN plant will be the first—to be complete by Oct., 2010
 - ▶ Better distillers grain
- 

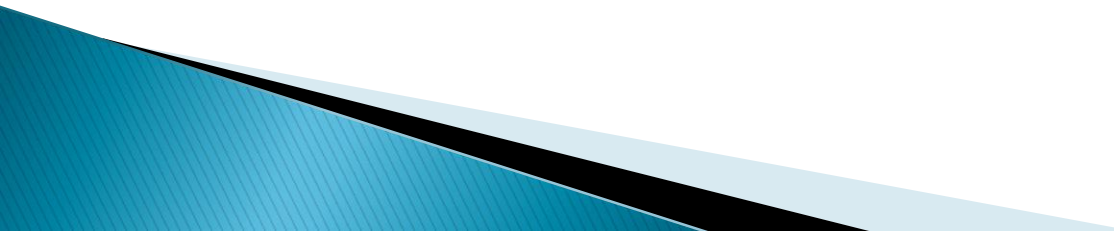
- ▶ Will cost \$18 million for all 6 plants
 - ▶ Expect \$15 million/year return
 - ▶ Corn oil will be used for:
 - commercial (plastics, etc.)
 - human food (corn oil)
 - livestock feed
 - biodiesel (corn oil cheaper than soy oil)
- 

Effect Of Obion, TN Plant On N.W. Tenn. Agriculture



- ▶ Uses 42 million bushels corn/year
 - ▶ 30% local corn (100 mile radius)
 - ▶ Project 50–60% due to increasing corn storage in the area
 - ▶ Local corn basis increase of 30 cents/bushel (i.e., if corn is selling on the Chicago Board of Trade for \$3.50/bu—local farmers can get \$3.80/bu)
 - ▶ Farmers deliver by truck
- 

Obion plant produces 360,000 tons distillers grains/year

- ▶ 75% sold locally (235 mile radius)
 - ▶ Farmers and others pick it up by truck
 - ▶ Some sold to feed cattle
 - ▶ Most goes for chicken and hog feed
 - ▶ Dog food plant in Mississippi
- 

Other than corn bought locally and distillers grains sold locally:

- ▶ The rest of the corn and distillers grains, and the ethanol is shipped by rail
- ▶ Inputs and products (other than local) are bought and sold by larger GPRE—to gain economy of scale

Questions?

